Short Answer Type Questions

1. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.
   - (a) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773K to form ammonia gas.
   - (b) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.
   - (c) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4.
   - (d) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

2. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.
   - (a) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.
   - (b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.
   - (c) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.
   - (d) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

3. Complete the missing components/variables given as x and y in the following reactions

   (a) $Pb(NO_3)_2\,(aq) + 2KI(aq) \longrightarrow PbI_2\,(x) + 2KNO_3(y)$

   (b) $Cu(s) + 2Ag\,NO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + x(s)$

   (c) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(x) + H_2(y)$

   (d) $CaCO_3(s) \xrightarrow{x} CaO(s) + CO_2(g)$

4. Which among the following changes are exothermic or endothermic in nature?

- (a) Decomposition of ferrous sulphate
- (b) Dilution of sulphuric acid
- (c) Dissolution of sodium hydroxide in water
- (d) Dissolution of ammonium chloride in water

5. Identify the reducing agent in the following reactions
   - (a) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$
   - (b) $H_2O + F_2 \rightarrow HF + HOF$
   - (c) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
   - (d) $2H_2 + O_2 \rightarrow 2H_2O$

6. Identify the oxidising agent (oxidant) in the following reactions
   - (a) $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$
   - (b) $2Mg + O_2 \rightarrow 2MgO$
   - (c) $CuSO_4 + Zn \rightarrow Cu + ZnSO_4$
   - (d) $V_2O_5 + 5Ca \rightarrow 2V + 5CaO$
   - (e) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
   - (f) $CuO + H_2 \rightarrow Cu + H_2O$

7. Write the balanced chemical equations for the following reactions
   - (a) Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogencarbonate.
   - (b) Sodium hydrogencarbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
   - (c) Copper sulphate on treatment with potassium iodide precipitates cuprous iodide (Cu_2I_2), liberates iodine gas and also forms potassium sulphate.

8. A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of

the chemical reaction?

9. Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction.
10. Why do fire flies glow at night?
11. Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment? Is it a chemical or a physical change?
12. Which among the following are physical or chemical changes?
    - (a) Evaporation of petrol
    - (b) Burning of Liquefied Petroleum Gas (LPG)
    - (c) Heating of an iron rod to red hot.
    - (d) Curdling of milk
    - (e) Sublimation of solid ammonium chloride

13. During the reaction of some metals with dilute hydrochloric acid, following observations were made.
    - (a) Silver metal does not show any change
    - (b) The temperature of the reaction mixture rises when aluminium (Al) is added.
    - (c) The reaction of sodium metal is found to be highly explosive
    - (d) Some bubbles of a gas are seen when lead (Pb) is reacted with the acid.

    Explain these observations giving suitable reasons.

14. A substance X, which is an oxide of a group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.
15. Write a balanced chemical equation for each of the following reactions and also classify them.
    - (a) Lead acetate solution is treated with dilute hydrochloric acid to form lead chloride

and acetic acid solution.

- (b) A piece of sodium metal is added to absolute ethanol to form sodium ethoxide and hydrogen gas.
- (c) Iron (III) oxide on heating with carbon monoxide gas reacts to form solid iron and liberates carbon dioxide gas.
- (d) Hydrogen sulphide gas reacts with oxygen gas to form solid sulphur and liquid water.

16. Why do we store silver chloride in dark coloured bottles?
17. Balance the following chemical equations and identify the type of chemical reaction.

(a) $Mg(s) + Cl_2(g) \longrightarrow MgCl_2(s)$

(b) $HgO(s) \xrightarrow{Heat} Hg(l) + O_2(g)$

(c) $Na(s) + S(s) \xrightarrow{Fuse} Na_2S(s)$

(d) $TiCl_4(l) + Mg(s) \longrightarrow Ti(s) + MgCl_2(s)$

(e) $CaO(s) + SiO_2(s) \longrightarrow CaSiO_3(s)$

(f) $H_2O_2(l) \xrightarrow{UV} H_2O(l) + O_2(g)$

18. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.
    - (a) Write the chemical formulae of X and Y.
    - (b) Write a balanced chemical equation, when X is dissolved in water.

19. Zinc liberates hydrogen gas when reacted with dilute hydrochloric acid, whereas copper does not. Explain why?
20. A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.
    - (a) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.

- (b) Name the black substance formed and give its chemical formula.

Long Answer Type Questions

1. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed
   - (a) Write a balanced chemical equation of the reaction.
   - (b) Identity the brown gas X evolved.
   - (c) Identity the type of reaction.
   - (d) What could be the pH range of aqueous solution of the gas X?

2. Give the characteristic tests for the following gases
   - (a) CO_2
   - (b) SO_2
   - (c) O_2
   - (d) H_2

3. What happens when a piece of
   - (a) zinc metal is added to copper sulphate solution?
   - (b) aluminium metal is added to dilute hydrochloric acid?
   - (c) silver metal is added to copper sulphate solution?

     Also, write the balanced chemical equation if the reaction occurs

4. What happens when zinc granules are treated with dilute solution of H_2SO_4, HCl, HNO_3, NaCl and NaOH, also write the chemical equations if reaction occurs.
5. On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.
   - (a) Write a balanced chemical equation of the reaction involved
   - (b) What other name can be given to this precipitation reaction?
   - (c) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?

6. You are provided with two containers made up of copper and aluminium. You are also provided with solutions of dilute HCl, dilute HNO_3, $ZnCl_2$ and H_2O. In which of the above containers these solutions can be kept?

Revision Notes for CBSE Class 10 Science Chapter 1 Chemical Reactions and Equations:

Chemical reactions: A chemical reaction is a process in which new substances (products) with different properties are formed as a result of the breaking of bonds in reactants.

Chemical equation: A chemical equation is a symbolic representation of a chemical reaction where the reactants and the products are shown by their symbols or formulas.

For example:

Na + Cl → NaCl

(Sodium) (Chlorine) (Sodium chloride)

Balanced chemical equation:

The chemical equation in which the number of atoms of each element in the reactants side is equal to that of the products side is called a balanced chemical equation.

 # Why it is necessary to balance a chemical equation?

Answer:

According to the law of conservation of mass, "mass can neither be created nor be destroyed in a chemical reaction. That is, the total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants. This is possible only if total number of atoms on the reactants side is equal to total number of atoms on products side. Thus, a chemical reaction should always be balanced.

 # What is a skeletal chemical equation?

Answer:

A skeletal equation is an unbalanced chemical equation, i.e., a chemical equation in which the total number of atoms of each element on the reactant side is not equal to the number of atoms of the same element on the product side.

Types of chemical reactions:

(i) Combination: The reaction in which two or more reactants combine to form one product is called Combination Reactions.

For example:

$Mg(s) + O_2(g) \rightarrow 2MgO(s)$

(Magnesium) (Oxygen) (Magnesium Oxide)

(ii) Decomposition: The reaction in which one compound decomposes in two or more compounds or elements is known as Decomposition Reaction.

For Example:

(iii) Displacement: The chemical reaction in which a more reactive element displaces a less reactive element from a compound is known as Displacement Reaction. It is also known as Substitution Reaction.

For Example:

When zinc reacts with copper sulphate, it forms zinc sulphate and copper metal.
$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

(iv) Double displacement: The Reaction in which ions are exchanged between two reactants forming new compounds is called Double Displacement Reaction.

For Example: When barium chloride reacts with sodium sulphate, white precipitate of barium sulphate is formed along with sodium chloride.
$BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl\ (aq)$

(v) Precipitation: The reaction in which an insoluble substance (precipitate) is formed by the mixing of two solutions containing salts is called the Precipitation Reaction.

For Example:

When barium chloride reacts with sodium sulphate, white precipitate (ppt.)of barium sulphate is formed along with sodium chloride.

$BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s)$ (white ppt.)$+ 2NaCl\ (aq)$

(vi) Neutralization: The reaction in which an acid reacts with a base to form salt and water by an exchange of ions is called Neutralization Reaction.

For example:

When sodium hydroxide reacts with hydrochloric acid, action of both gets neutralised forming sodium chloride and water.

$NaOH(aq) + HCl(aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$

(vii) Oxidation: A reaction that includes gain of oxygen or removal of hydrogen (or loss of electrons).

For example:

$C + O_2 \rightarrow CO_2$

Reduction: A reaction that includes removal of oxygen or addition of hydrogen (or gain of electrons).

For example:

→ A substance that gains oxygen during a reaction, it is said to be oxidised.

→ A substance that loses oxygen during a reaction, it is said to be reduced.

Oxidising agent : A substance that oxidises another substance and itself gets reduced.

Reducing agent: A substance that reduces another substance and itself gets oxidised.

Effects of oxidation reaction in everyday life:

Corrosion: The gradual eating up of metals by the action of air and moisture on their surface is called corrosion.

The most common example of corrosion is rusting of iron.

$4Fe + 3O_2 + 2nH_2O \rightarrow 2Fe_2O_3.nH_2O$

Steps to prevent rusting of iron:

(i) Coating the iron surface with oil, grease or paint
(ii) Depositing a layer of zinc on the surface of iron. This process is called galvanisation.
(iii) Forming alloys of iron

Rancidity: When fats and oils are exposed to air, they get oxidized and become rancid and their smell and colour change. This phenomenon is called rancidity

Steps to prevent rancidity:
(i) Storing food materials in air-tight containers
(ii) Packaging food items in bags containing nitrogen
(iii) Refrigeration of food items
(iv) Addition of antioxidants or preservatives to the foods containing fats and oils

Questions for self-assessment:

1. Why should a magnesium ribbon be cleaned before burning in air?

2. What happens when a piece of silver metal is added to copper sulphate solution?

3. Write a balanced chemical equation for the following:

(i) when 1 mL of dil. Hydrochloric acid is added to 1g of Sodium metal.

(ii) when a solution of potassium chloride is mixed with sodium chloride.

(iii) A piece of sodium metal is added to absolute ethanol to form sodium ethoxide and hydrogen gas.

4. Why do copper vessels lose their shine when exposed to air?

5. Why does the colour of copper sulphate solution change when an iron nail is dipped into it?

6. Why is the bag used for potato chips flushed with nitrogen gas?

7. Write down the balanced chemical equations for the following reactions.
a) Zinc Carbonate(s) → Zinc Oxide + Carbon Dioxide(g)
b) Aluminium(s) + Chlorine(g) → Aluminium Chloride(s)
c) Magnesium(s)+ Water(l) → Magnesium Hydroxide(l) + Hydrogen(g)